CHAPTER 12

REPLACING HARDWARE

12-1. ATTACHING HARDWARE

Hardware is the metal equipment attached to a canvas or webbed item. Tack-buttons, grommets, snap fasteners, end clips, and rivets are fastened directly to the cloth. Some hardware, such as tent line slips, is attached directly to lines and poles. Other hardware is attached to tents and other items by means of canvas or webbing loops called chapes. When hardware is missing, broken, bent, cracked, rusted, or damaged in any other way, it is replaced with new or salvaged hardware.

Often it is necessary to darn, patch, or replace the supporting canvas. Newly attached hardware should be in good condition, properly positioned, and securely fastened to the canvas or webbed item. Fabric repair specialists should be familiar with all the hardware described in Table 12-1 and shown in Figure 12-1. Directions for attaching tack-buttons, grommets, snap fasteners, end clips, rivets, and tent line slips are given in tbis chapter.

Table 12-1. Hardware items

ITEM	DESCRIPTION
1. Rings	Round metal pieces used to fasten tie tapes, catch snap hooks, and support handworked grommets
2. Loops	Elongated metal pieces used to hold webbing straps and to support handworked grommets
3. Rings	D-shaped metal pieces used to catch snap hooks and loop over pole spindles on tents
4. Triangles	Triangular metal attachments used to ease the strain on canvas at pole spindles
5. Links	Metal pieces similar to chain links used at points where pole spindles pass through tent eaves and also used over pole spindles to support eave lines

Table 12-1. Hardware items (continued)

ITEM	DESCRIPTION
6. Squares	Square metal pieces used with webbing
7. Double hooks	Metal pieces with two hooks used to attach canvas equipment to the individual equipment belt
8. Slide loops	Rectangular metal pieces with center bars used to adjust straps
9. Snap hooks	Metal hooks with spring-steel snaps used to catch numerous pieces of hardware
10. Wall D-rings	Fan-shaped D-rings used on assembly tents
11. S-hooks	S-shaped hooks used to catch rings and other pieces of hardware
12. Triangle with hooks	Triangular-hooked metal pieces used to connect fair-leads to webbing supports of tents
13. Fairleads	Magnesium metal casings used to keep eave lines from rubbing the canvas at tent eaves
14, 15, 16 Buckles	Metal fasteners used on strap ends
17. Sliding keepers	Metal pieces with slots used to hold straps in place
18. Fasteners	Hooking metal devices used to fasten belt ends
19. Rope tips	Metal caps used to finish rope ends
20. Fastener supports	Metal, U-shaped pieces used to hold the male sections of style 1 snap fasteners
21. Ridge plates	Metal plates with holes used to protect and support the canvas around ridge pole spindles
22. Chains and plates	Metal plates with chains used at peaks on pyramid-shaped tents
23. Thimbles	Oval metal inserts which fit into splice eyes and are used to reinforce the ends of lines
24. Bull’s eyes	Round wooden blocks with holes in the center used to carry hoisting lines
25. Staples	U-shaped metal pieces with finished ends which are riveted to cloth
26. Double washers	Metal pieces with holes in each end which are used to prevent staples from pulling through cloth
27. Shackle-type diamond eye hooks	Heavy steel wire hooks which have upper and lower shackles connected with bolts and nuts

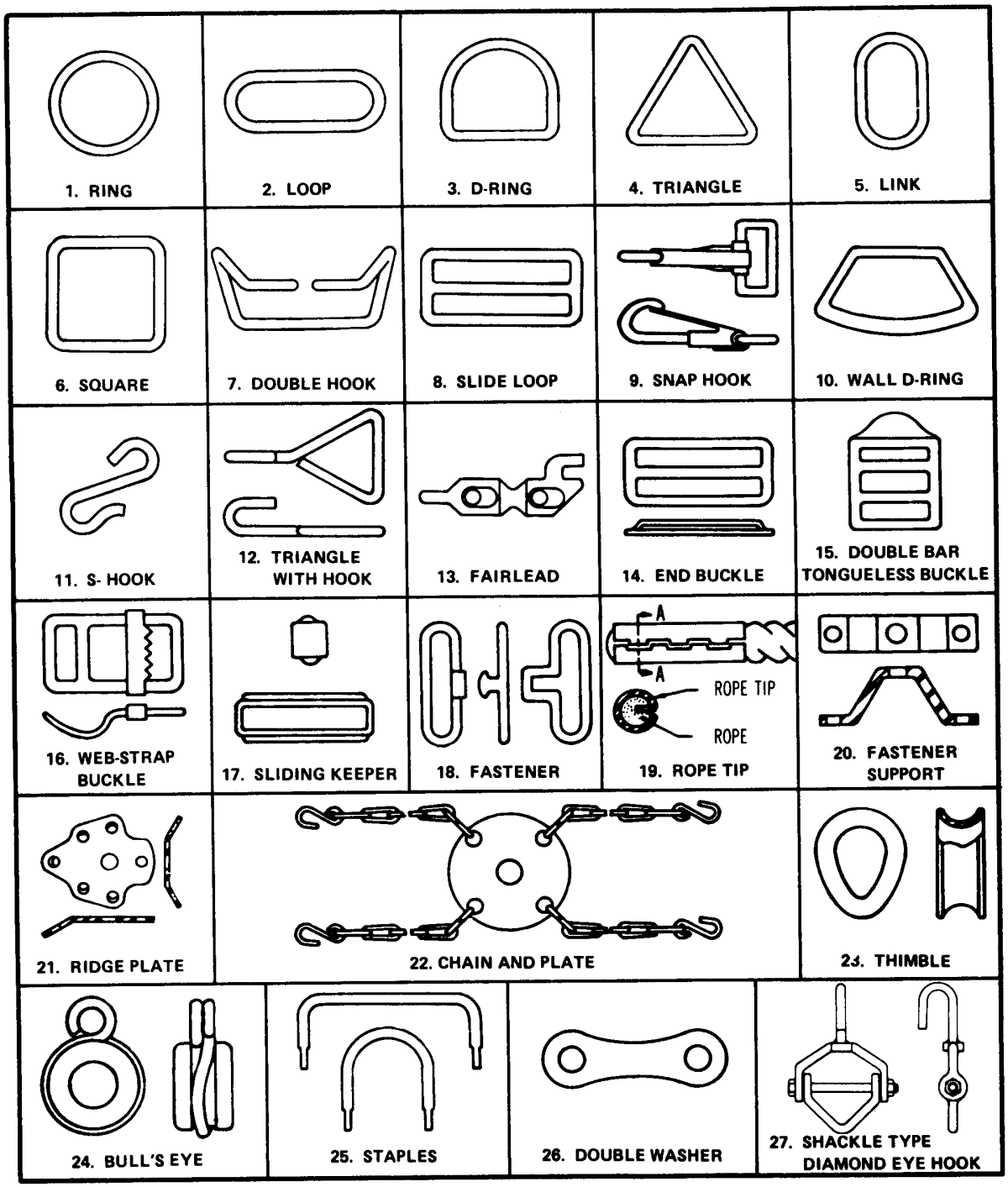

Figure 12-1. Hardware pieces

12-2. REPLACING TACK-BUTTONS

A tack-button (Figure 12-2) is a two-part button that is used to close openings on canvas and webbed items. It can be attached either by hand or by using a tack-button attaching machine (Figure 12-3). Both ways are described below.

a. Attaching by Hand. To hand fasten a tack-button--

(1) Remove the damaged tack-button, and repair the canvas or webbing.

(2) Mark the exact position of the tack-button with chalk.

(3) Place the canvas or webbed item faceup on top of a smooth, hard surface.

(4) Push the tack through the chalk mark from the underside of the canvas or webbing.

(5) Tap the button lightly with a rawhide mallet hard enough to clinch the tack and button to the canvas or webbing without damaging the tack-button or cloth.

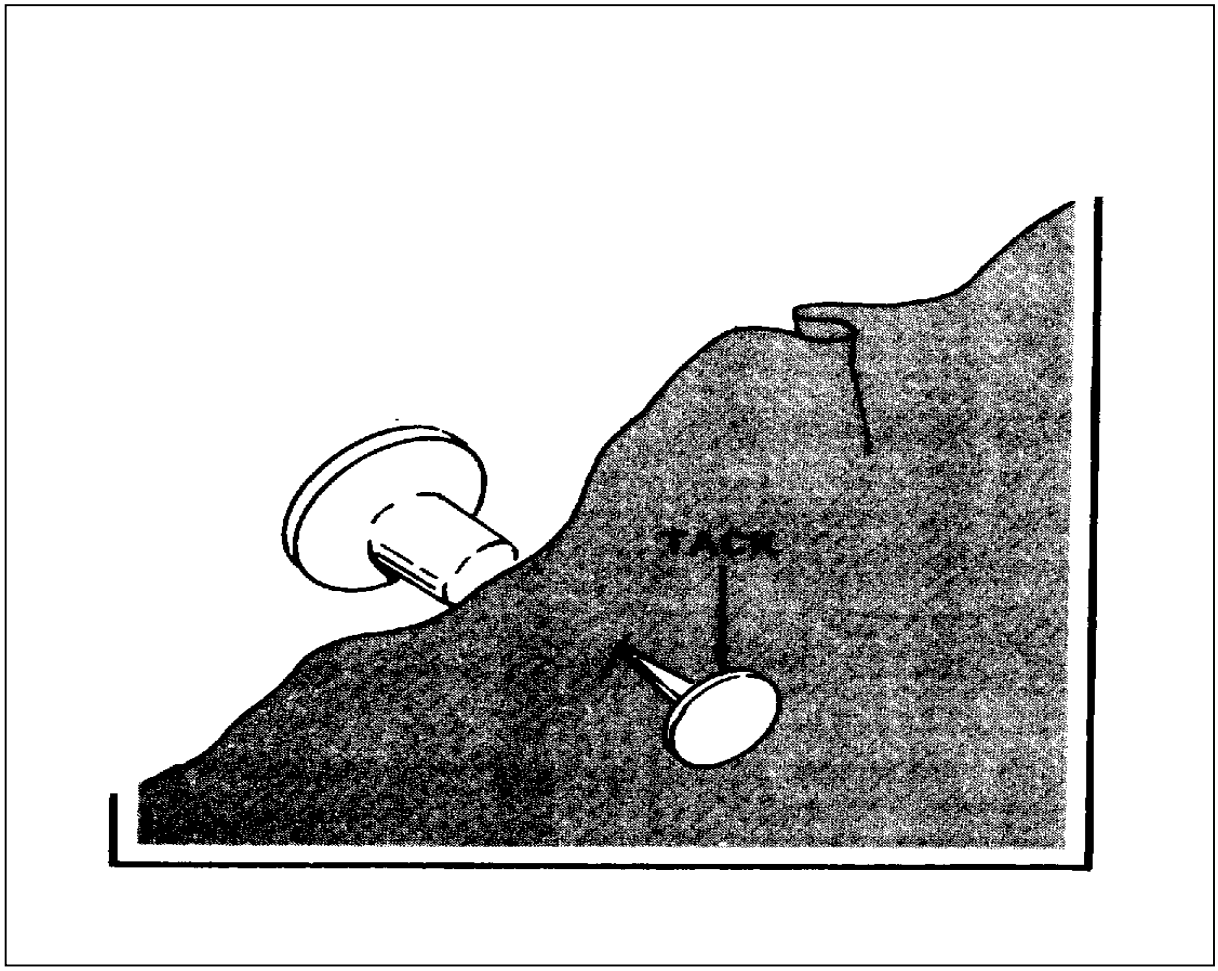

Figure 12-2. Tack-button

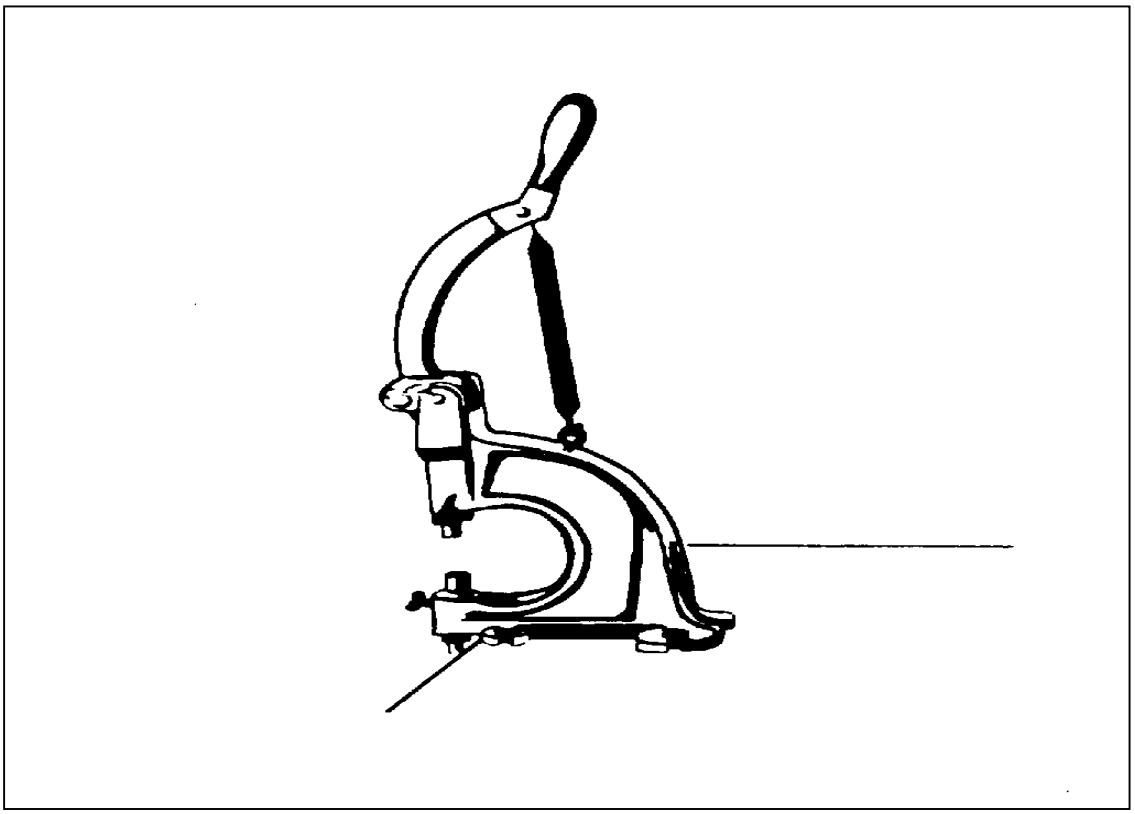

Figure 12-3. Tack-button attaching machine

b. Attaching by Machine. Detailed instructions for operating a tack-button attaching machine are given in TM 10-3530-207-14. To machine fasten a tack-button--

(1) Remove the damaged tack-button, and repair the canvas or webbing.

(2) Mark the exact position of the tack-button with chalk.

(3) Put the appropriate upper and lower die in the machine, and adjust the pitch.

(4) Raise the hand lever, and put the button into the upper die.

(5) Drop the tack, point up, into the lower die.

(6) Position the canvas or webbing faceup over the lower die and tack.

(7) Press down the hand lever firmly to clinch the tack and button to the cloth.

(8) Raise the lever and remove the canvas or webbing item.

(9) Remove the die from the machine.

12-3. REPLACING GROMMETS

Grommets are large metal eyelets or rings which are used to reinforce canvas and webbing where holes are made to hold ropes, lines, spindles, and webbed straps. If the canvas surrounding the grommet is damaged, it is repaired with a grommet-support patch before the grommet is replaced. In an emergency, the damaged grommet can be removed, and a larger grommet can be put in its place. This is done only when there is enough undamaged canvas to support the larger grommet adequately. Grommets are handworked or die-inserted.

a. Handworked. A handworked grommet is an iron ring sewn in place around a grommet hole. This type of grommet is often used in large tents because it can take a lot of strain. To handwork a grommet--

(1) If the old grommet hole will be used, obtain a rawhide mallet, sailmaker's needle, thread, wax, and an iron ring with an inside diameter larger than that of the hole. Also obtain a fid (a tapered, wooden or metal pin).

(2) If a new grommet hole will be cut, obtain the tools listed above, a heavy woodblock, and a size 5 cutting punch for a 1/2- or 3/4-inch ring or a size 6 cutting punch for a 1-inch ring. Position the canvas faceup on the end-grain surface of the woodblock, and cut a grommet hole with the appropriate cutting punch (Figure 12-4).

(3) Center the ring over the grommet hole.

(4) To make stitching easier, use the sailmaker's needle to make a series of equally spaced holes about 1/8 inch from the outside edge of the metal ring (Figure 12-5). Do not make the holes any larger than 1/16 inch across.

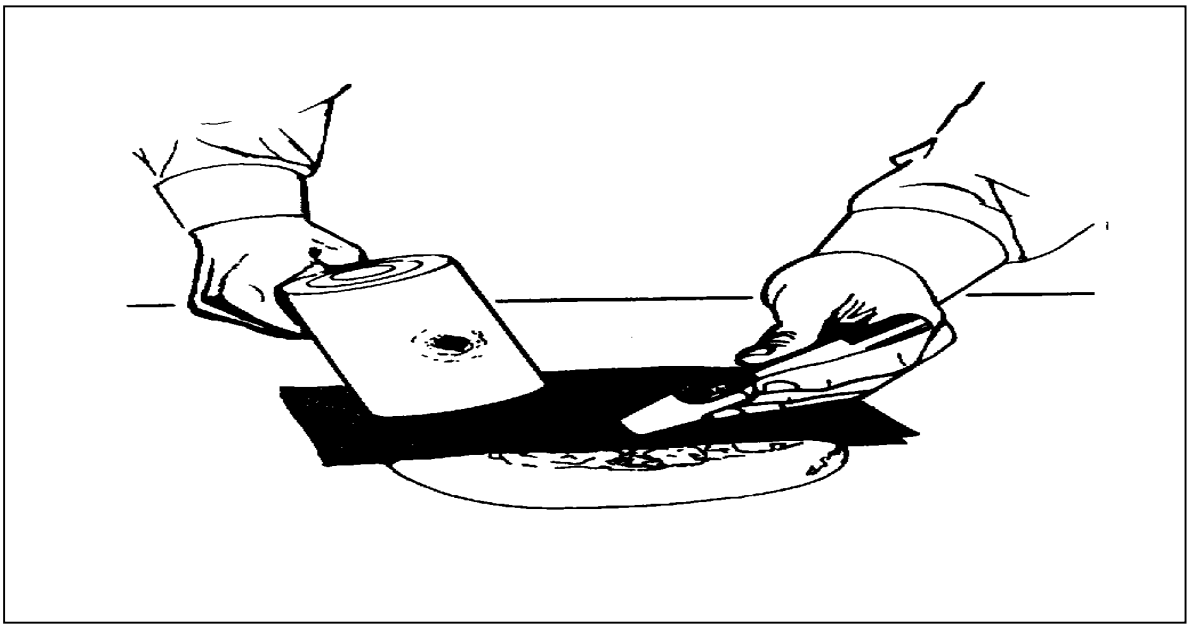

Figure 12-4. Cutting a grommet hole

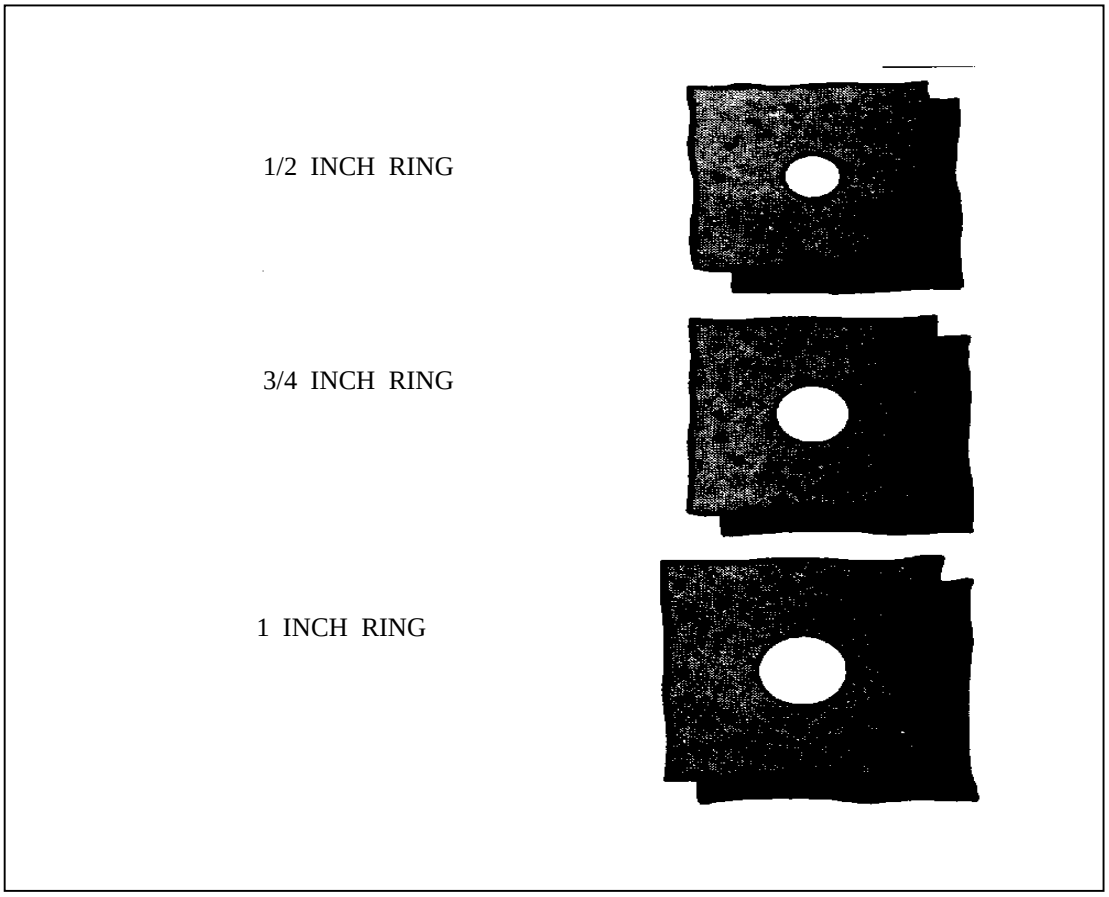

Figure 12-5. Series of equally spaced holes

(5) Thread the needle with four strands of waxed thread, and knot the ends. Twist the strands together, rewax the thread, and cut off the knot.

(6) Stick the needle into one of the needle holes, and draw the thread through the hole until a 1/2-inch end is left.

(7) Hold the 1/2-inch length of thread down against the canvas and the edge of the ring with the free end pointing clockwise.

(8) Bring the needle up through the grommet hole, over the ring and the 1/2-inch end, and stick it down into the next needle hole.

(9) Continue stitching clockwise, making a series of round stitches around the grommet hole (Figure 12-6).

(10) Finish the stitching by sticking the needle under the last two stitches and pulling the thread up tightly.

(11) Leave free a 1/2-inch length of thread, and cut the thread.

(12) Flatten the stitching by pushing the fid into the grommet hole, first from one side and then the other.

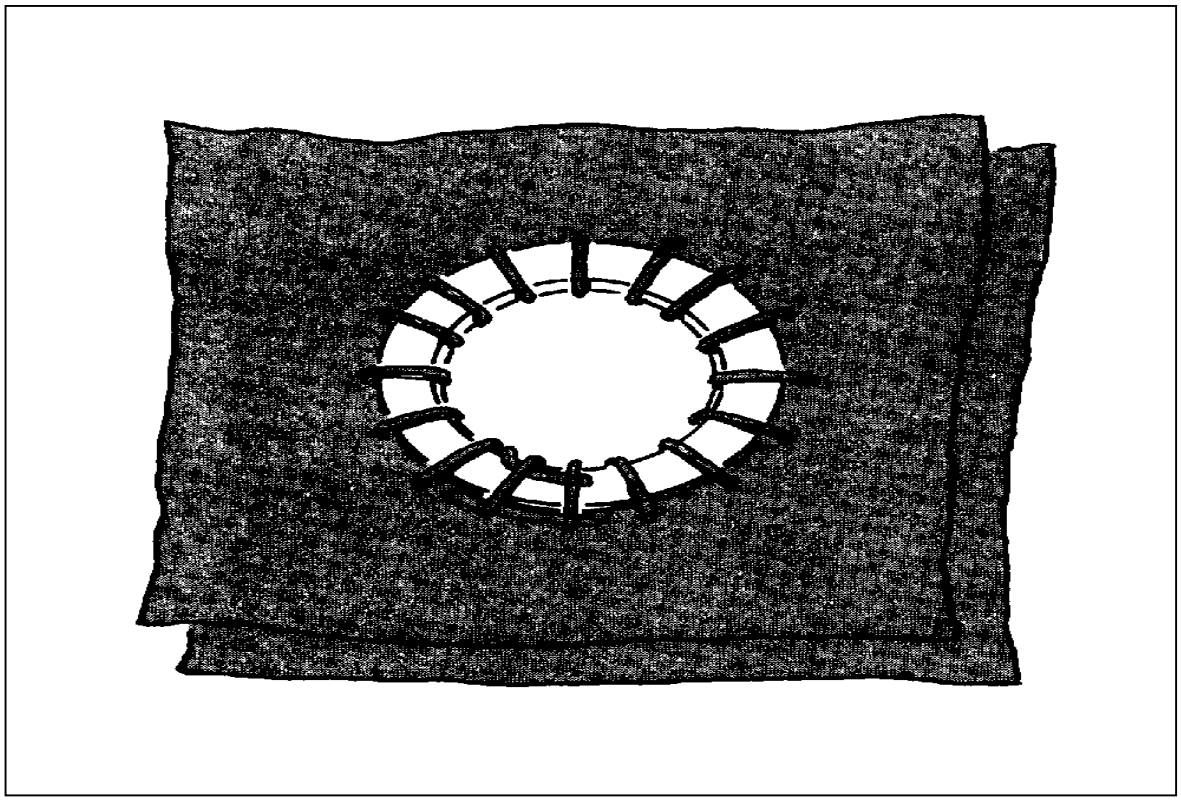

Figure 12-6. Series of round stitches around a grommet

b. Die-Inserted. A die-inserted grommet consists of two brass parts. The male half, called a barrel, is smooth. The female half, called a washer, has spurs that grip the canvas or webbing. Punch-and-die sets are used to clinch the two parts together. To insert a grommet--

(1) If the old grommet hole will be used, obtain a rawhide mallet, a brass grommet, and a punch-and-die set. Use a size 4 punch-and-die with a size 4 grommet and a size 5 punch-and-die with a size 5 grommet.

(2) If a new grommet hole will be cut, obtain the tools listed above, a heavy woodblock, and a size 5 cutting punch for a size 4 grommet and a size 6 cutting punch for a size 5 grommet. Position the canvas faceup on the end-grain surface of the woodblock, and cut a grommet hole with the cutting punch.

(3) Insert the barrel into the hole through the underside of the canvas.

(4) Place the canvas and the flat bottom part of the barrel on the grommet die (Figure 12-7).

(5) Place the washer, spurs down, over the barrel.

(6) Insert the punch into the barrel, and hold the punch in place with one hand.

(7) Hit the top of the punch with a rawhide mallet hard enough to clinch the two parts to the canvas without damaging the grommet or the canvas (Figure 12-8). When the parts are clinched properly, the edge of the barrel has a smooth roll.

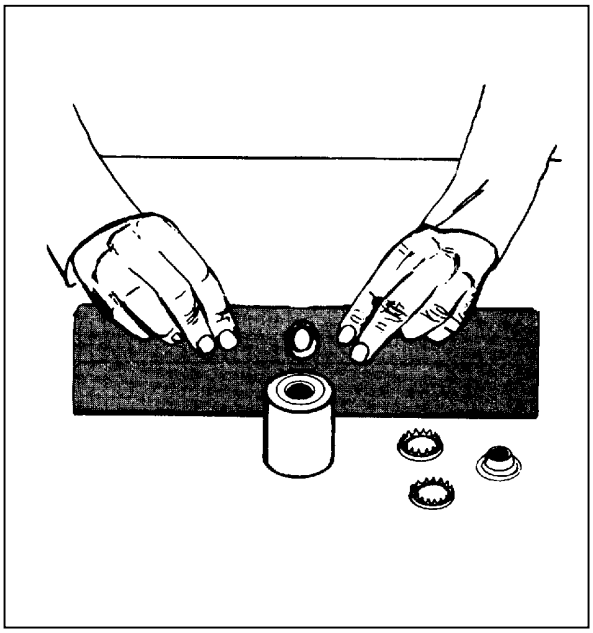

Figure 12-.7. Placing barrel on grommet die

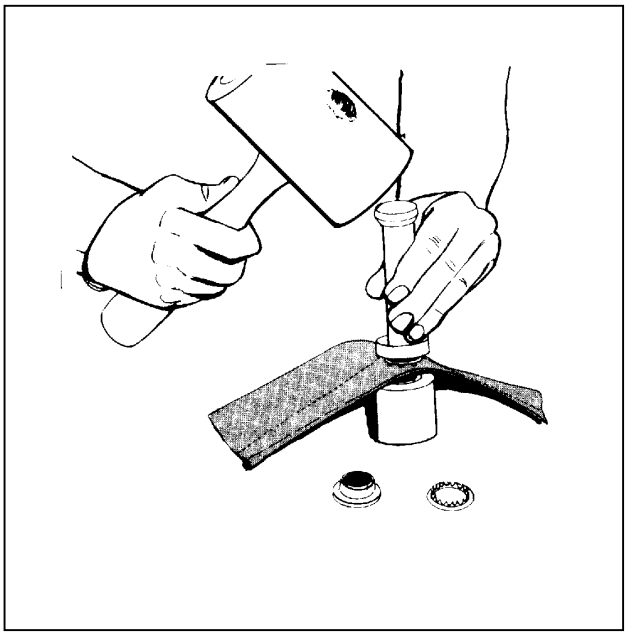

Figure 12-.8. Hitting punch with a rawhide mallet

12-4. REPLACING SNAP FASTENERS

The two types of snap fasteners used to close openings on canvas and webbing are styles 1 and 2. Style 1 can be used on heavier canvas than style 2.

a. Style 1 Snap Fastener. A style 1 snap fastener has two sections, a female half and a male half. The female half has two parts, a socket and a clinch plate. The male half also has two parts, a stud and a washer. The stud is available in two sizes, single and double. The double stud is twice as long as the single stud and can hold an additional layer of canvas. To install a style 1 snap fastener (Figure 12-9)--

(1) Obtain a style 1 snap fastener, chalk, socket punch, socket anvil, hole punch, stud set, stud anvil, rawhide mallet, and lead block.

(2) Remove the old snap fastener, and patch or replace the canvas if necessary.

(3) Mark with chalk the exact position of the hole for the female half of the snap fastener.

(4) Place the canvas over the lead block so that the chalk mark is centered on the block.

(5) Center the socket punch over the chalk mark.

(6) Hit the socket punch with a rawhide mallet to make slots for the socket prongs and a center hole.

(7) Insert the socket prongs into the slits through the underside of the canvas.

(8) Place the clinch plate over the socket prongs.

(9) Place the canvas and socket, prongs up, on the socket anvil.

(10) Bend the socket prongs toward the center with the top of the socket punch until the prongs are flat against the clinch plate and the plate and socket are securely clinched to the canvas.

(11) Mark the exact position of the hole for the male half of the snap fastener.

(12) Use a hole punch to make a hole a little smaller than the barrel of the stud so that the barrel will fit snugly into the hole.

(13) Insert the barrel of the stud up through the hole.

(14) Center the canvas and stud, with the barrel up, on the stud anvil.

(15) Place the washer over the barrel of the stud.

(16) Place the tip of the stud set in the barrel. Hold the stud set in place with one hand.

(17) Hit the top of the stud set with the rawhide mallet, securely clinching the stud and the washer to the canvas.

b. Style 2 Snap Fastener. The style 2 snap fastener is identical to the snap fastener used on clothing. Paragraph 4-11 describes this style of snap fastener and how it is installed. Follow the same instructions to install a style 2 snap fastener on canvas and webbing, but use a patch instead of a darn to repair the supporting canvas in a tent.

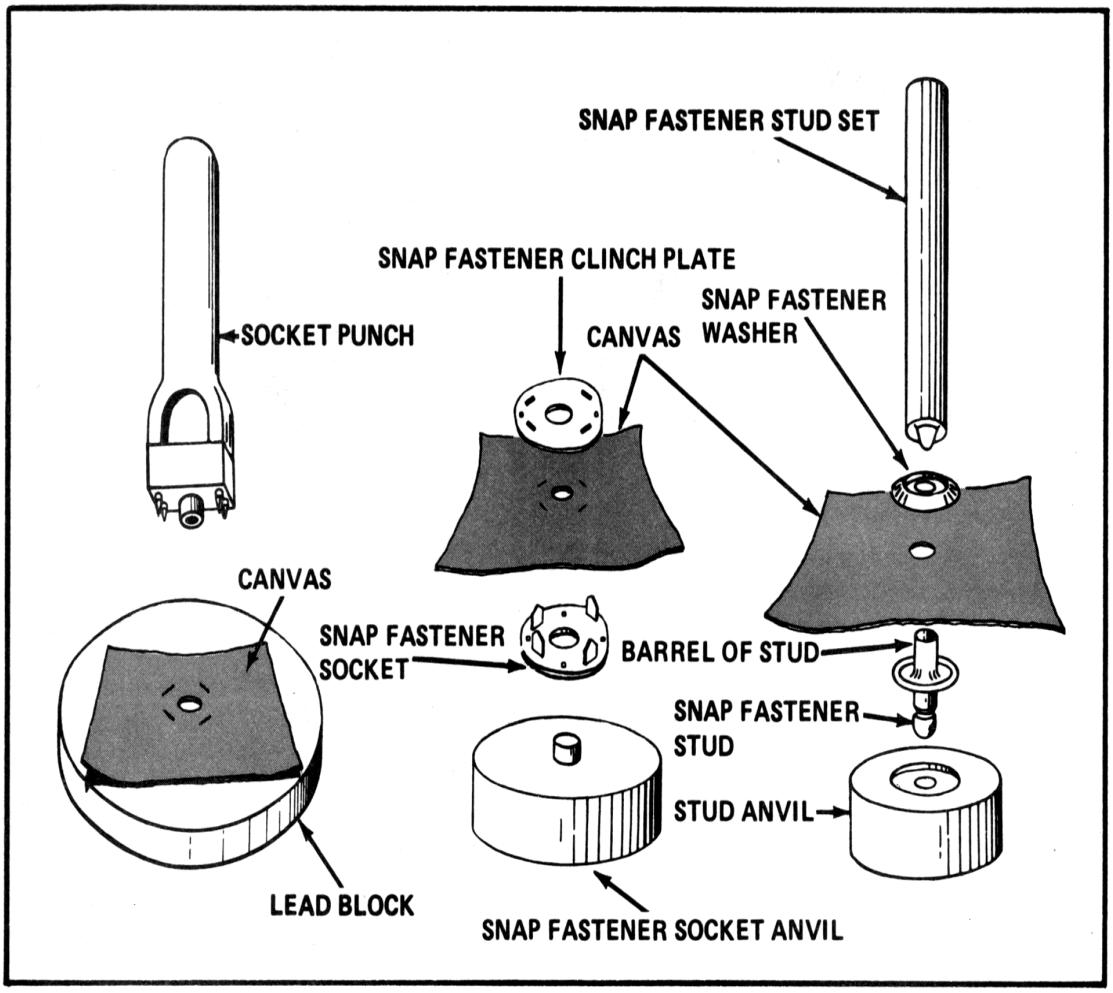

Figure 12-9. Replacing a type 1 snap fastener

12-5. ATTACHING END CLIPS

End clips are metal tips used to prevent the cut ends of webbing from unraveling. They also make it easier to insert webbing ends into grommets and buckles. The three types of end clips (Figure 12-10) are ball-type, flat-type, and end buckle.

a. Ball-Type End Clip. The ball-type end clip looks like a hollow metal ball before it is attached to webbing. It fits like a thimble over the end of the webbing. To attach this clip, stick the webbing into the clip, partially flatten the clip with a hammer, straighten the webbing, and finish flattening the clip.

b. Flat-Type End Clip. The flat-type end clip is a V-shaped strip of metal. The ends of the clip have teeth which grip the webbing. To attach this clip, stick the webbing into the jaws of the clip, and flatten the clip with a hammer.

c. End Buckle Clip. The end buckle clip is a flat-type end clip with a slot for a buckle or hook. It also has holes for riveting the clip in place after it has been flattened with a hammer.

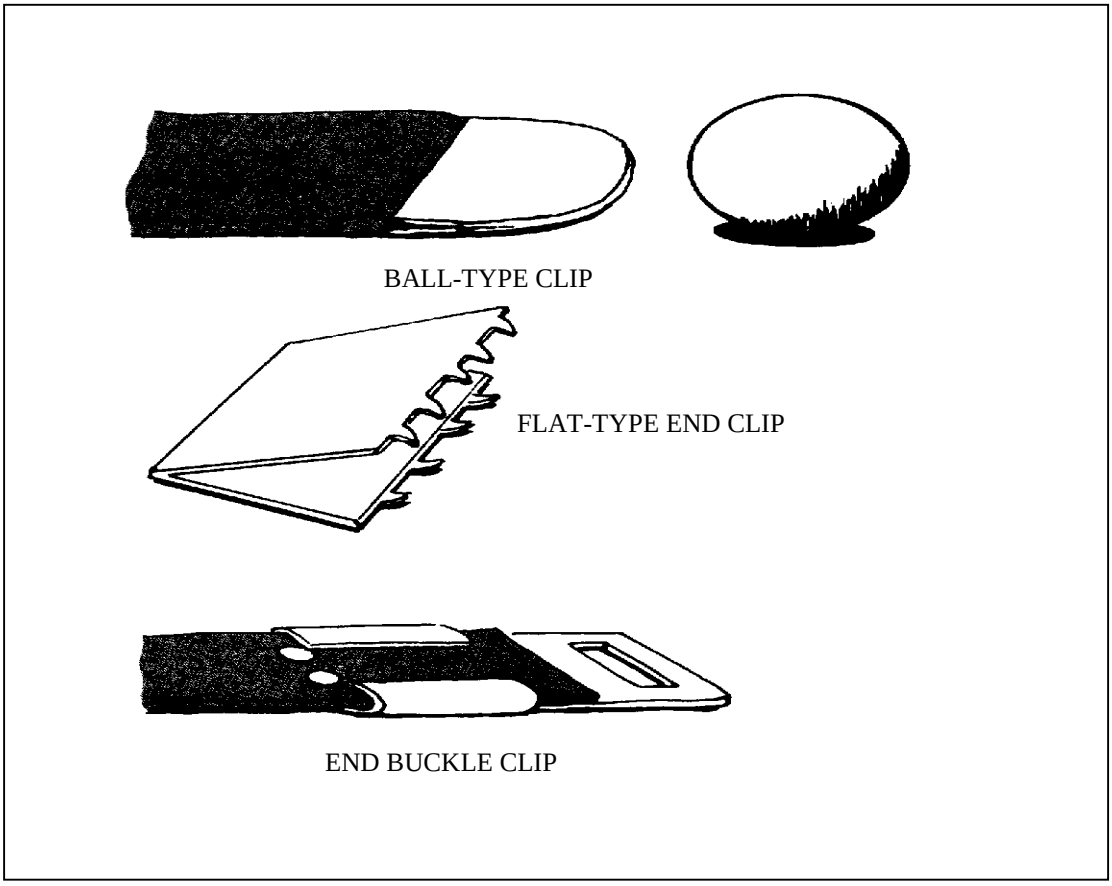

Figure 12-10. End clips

12-6. INSTALLING RIVETS

Rivets are metal pins and heads which are used to hold two or more pieces of canvas together. The two types of rivets are belt and tubular. All rivets are installed by the same method.

a. Belt Rivets. Belt rivets (Figure 12-11) are made of solid brass or copper. They come in sizes 8, 10, 12, and 14, with lengths from 3/8 to 1 1/4 inches. The head of this type of rivet is called a burr. The burr size used should match that of the rivet.

b. Tubular Rivets. Tubular rivets (Figure 12-11) are made with hollow brass shanks. They come in 3/16- to 3/4-inch lengths. The head of this rivet is called a cap. The end of a tubular rivet is beveled so that it will form a flange inside the rim of the cap.

c. Installation. To install a belt or tubular rivet--

(1) Use a hole punch to cut a hole in the layer or layers of canvas or webbing. Make the hole small enough to fit tightly around the rivet.

(2) Insert the rivet into the hole. Use a size of rivet that will pass through all the canvas or webbing with very little excess and still take a cap or burr.

(3) Place the canvas or webbing and the rivet, head down, on a metal block.

(4) Place the burr or cap on the rivet.

(5) Clinch the burr and belt rivet together by hitting the burr with a ball peen hammer. Clinch the cap and tubular rivet together by hitting the cap with a plain-faced hammer.

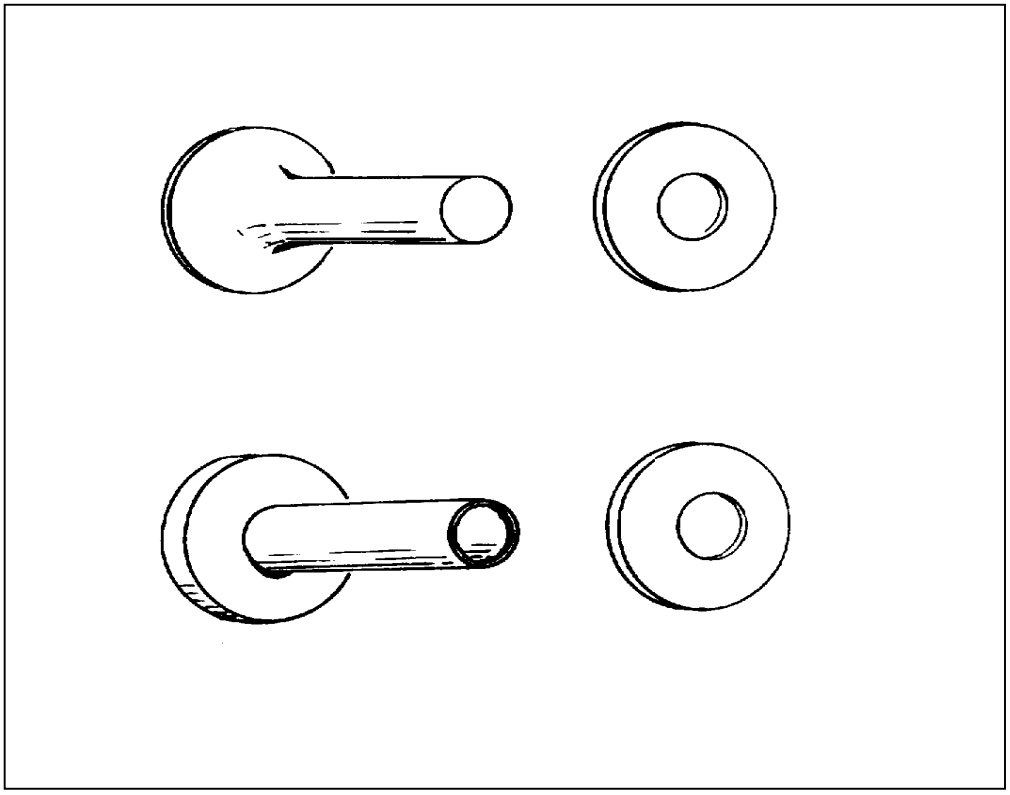

Figure 12-11. Rivets

12-7. INSTALLING TENT LINE SLIPS

Tent line slips (Figure 12-12) are metal devices used to adjust eave and guy lines on a tent. There are four types of tent line slips.

a. Wire Slip. A wire slip is 4 inches long and 3/16 inch wide. It is made of steel. One end is coiled like a spring, and the other end is looped to form an eye. To install a wire slip--

(1) Pass one end of an eave line through the coil from the opening closest to the outside.

(2) Pull 2 feet of line through the coil.

(3) Pass the same end of the line through an eave grommet from the roof side to the wall side.

(4) Pass the same end of the line through the eye of the wire slip.

(5) Secure the slip to the line by tying an overhand knot in the end of the line.

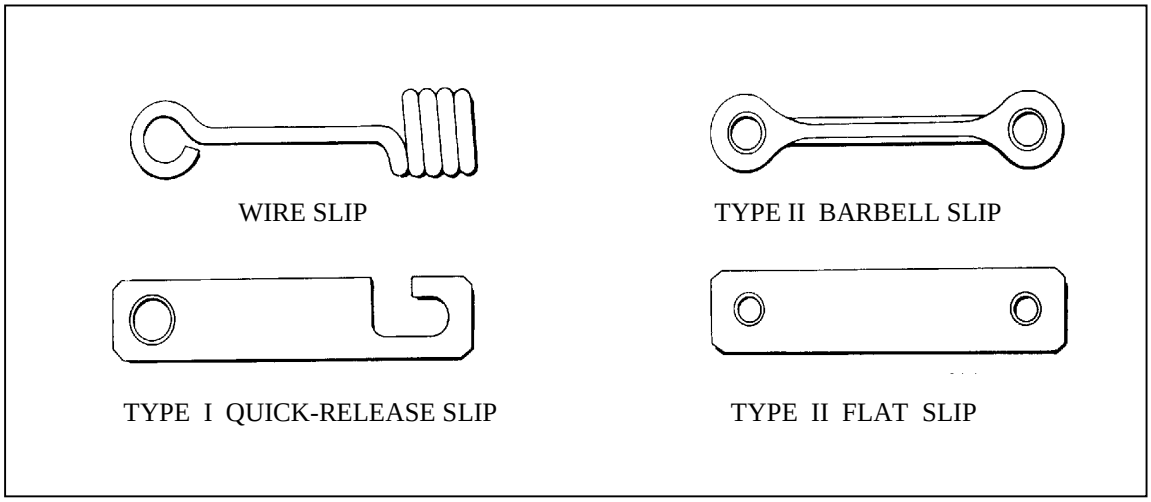

Figure 12-12. Tent line slips

b. Type I Quick-Release Flat Slat. This slip is 4 inches long and 7/8 inch wide. It is made of magnesium alloy. It has a round hole at one end and a quick-release side opening at the other end. To install a type I quick-release flat slip--

(1) Pass one end of an eave line through the hole in the slip.

(2) Pull 2 feet of line through the hole.

(3) Pass the same end of the line through an eave grommet from the roof side to the wall side.

(4) Pass the same end through the side opening at the other end of the slip.

(5) Secure the slip to the line by tying and overhand knot in the end of the line.

c. Type II Barbell Slip. This slip is 4 inches long and has a 7/16-inch-wide hole at each end. It looks like a barbell. To install a type II barbell slip--

(1) Pass one end of and eave line through on of the holes in the slip.

(2) Pull 2 feet of line through the hole.

(3) Pass the same end of the line through an eave grommet from the roof side to the wall side.

(4) Pass the same end of the line through the other hole in the slip.

(5) Secure the slip to the line by tying an overhand knot in the end of the line.

d. Type III Flat Slip. This slip is similar to the quick-release flat slip, but it has a hole at each end instead of a hole and a side opening. It is installed using the same method that is used to install a type II barbell slip.